



**FIG. 1A CDMA Transmitter: Block Diagram**

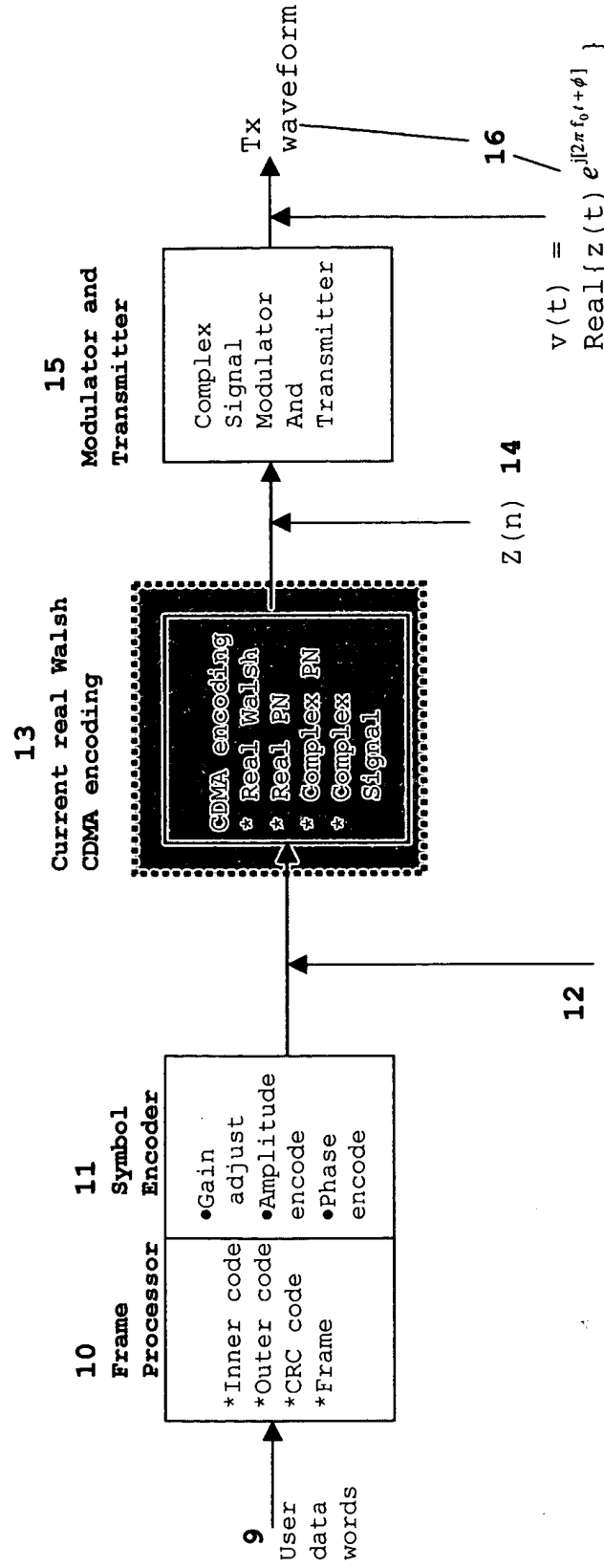


FIG. 1B CDMA Transmitter: Cellular Application

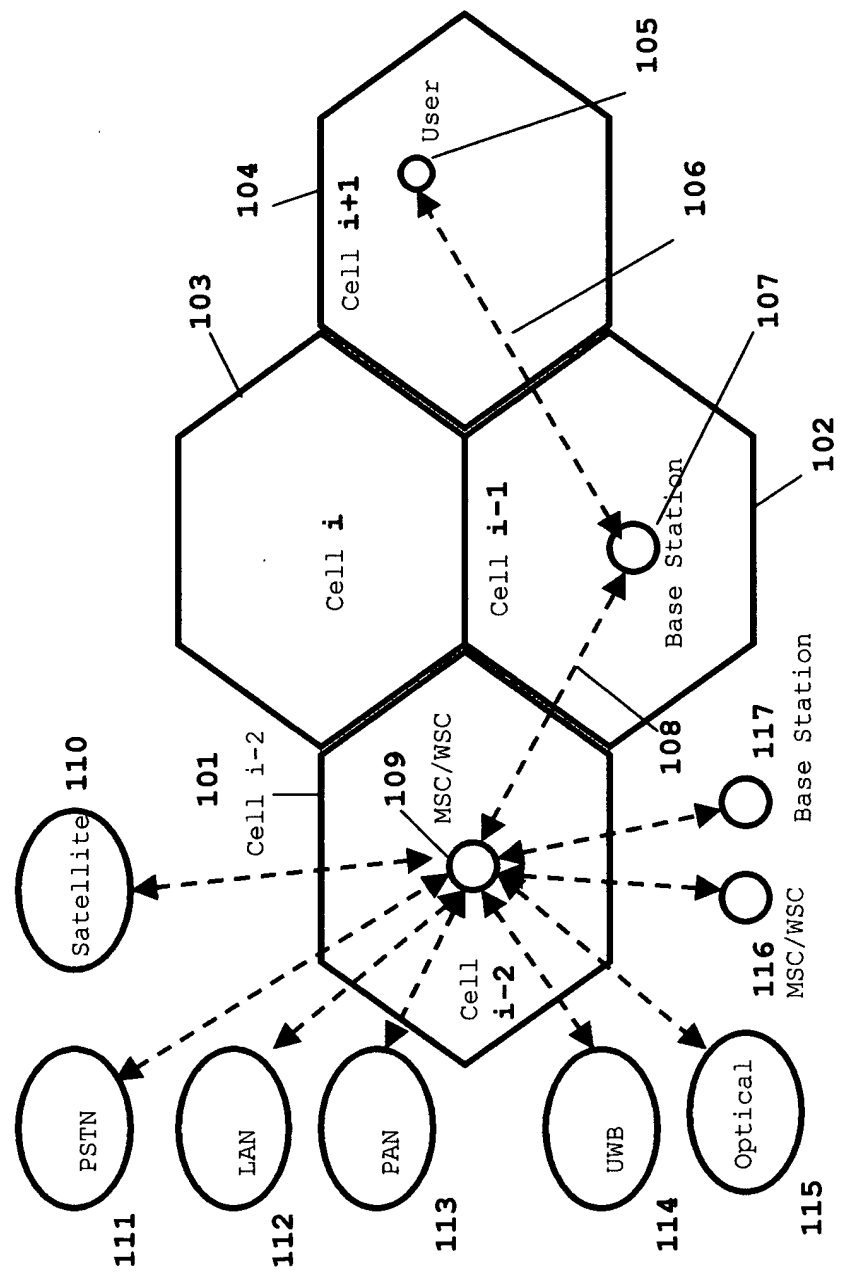
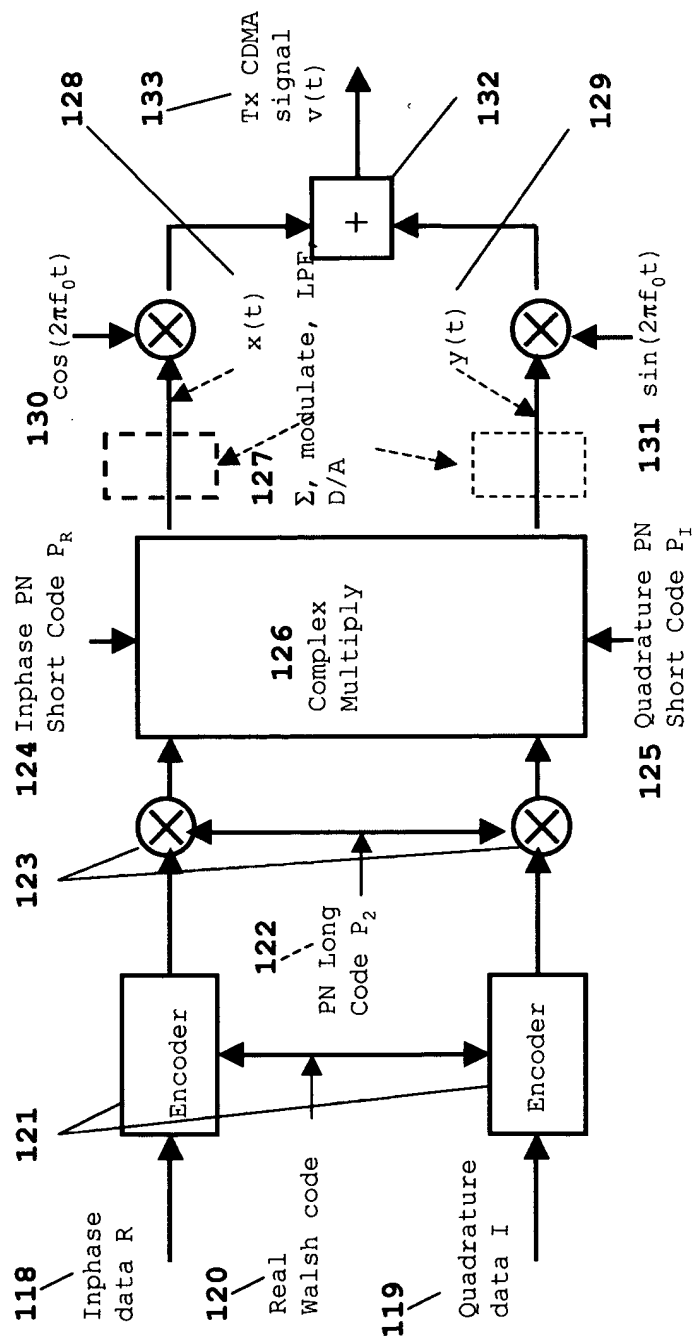
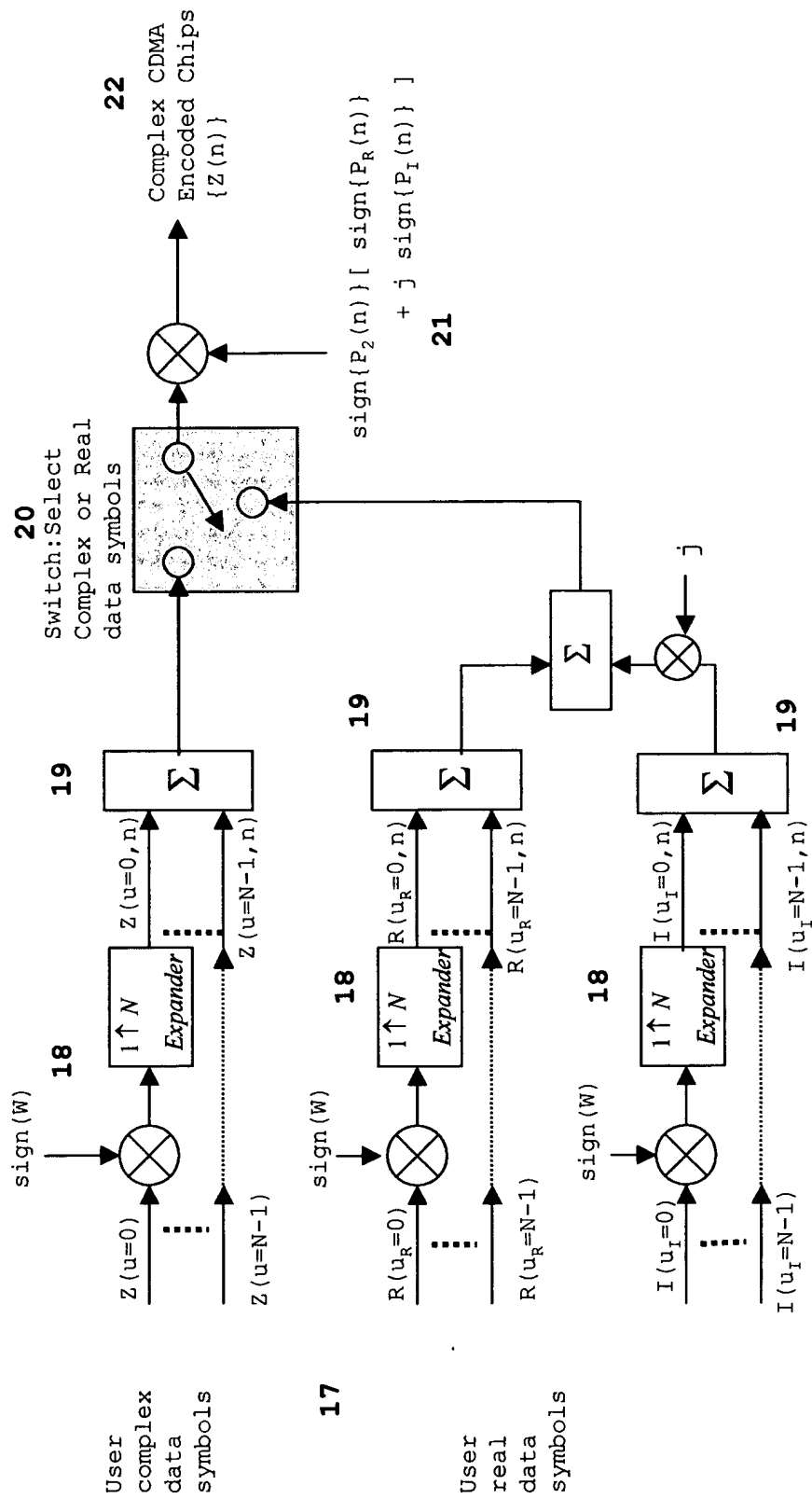


FIG. 1C CDMA Transmitter: Cellular Implementation



**FIG. 2 Real Walsh CDMA Encoding Implementation**





**FIG. 3A CDMA Receiver: Block Diagram**

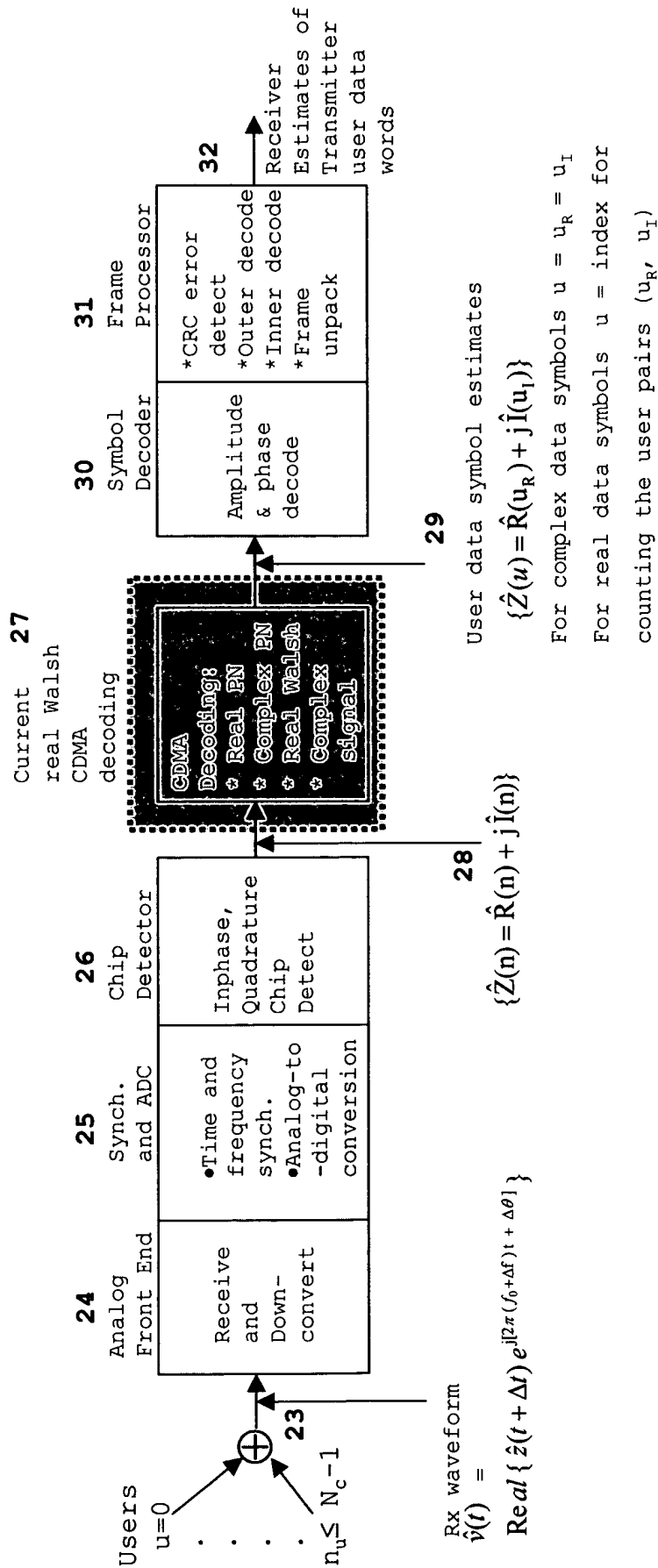


FIG. 3B CDMA Receiver: Cellular Implementation

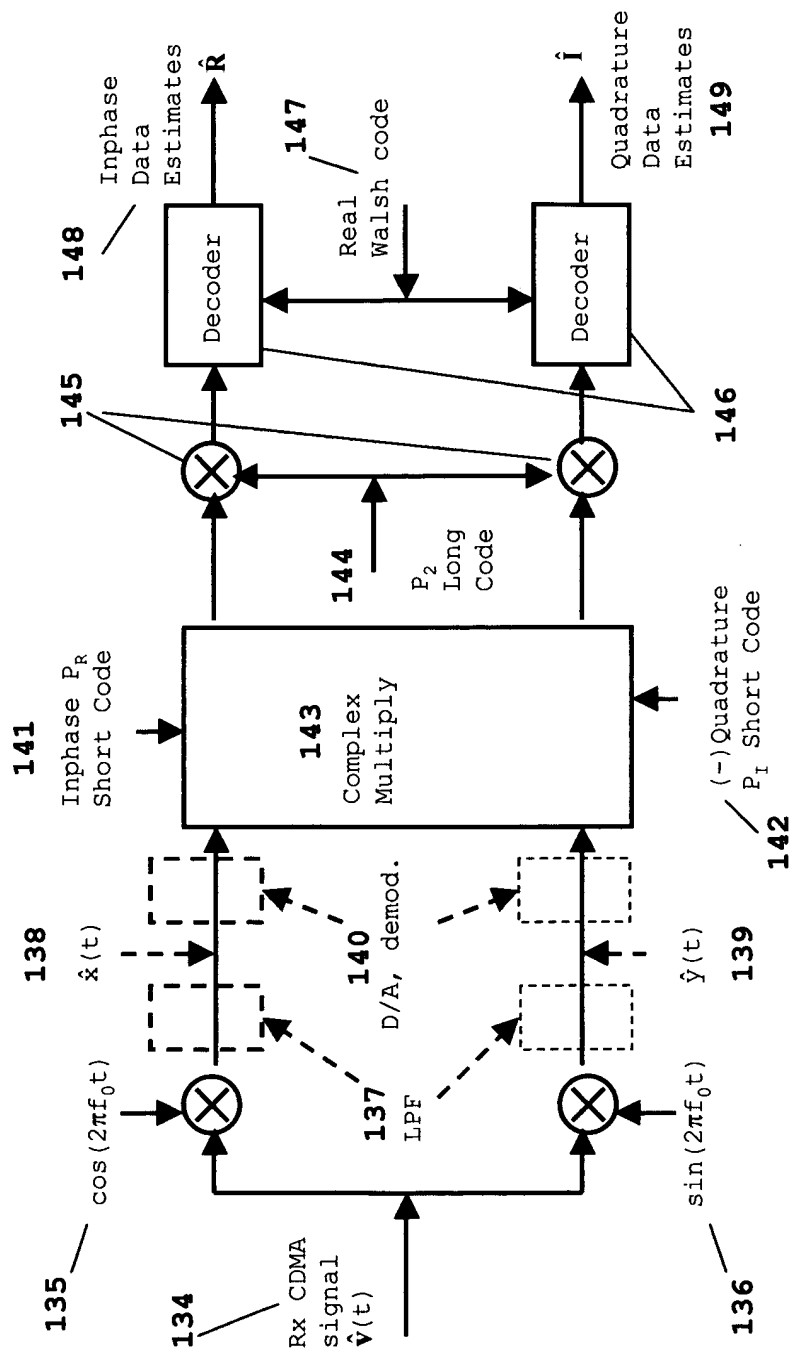
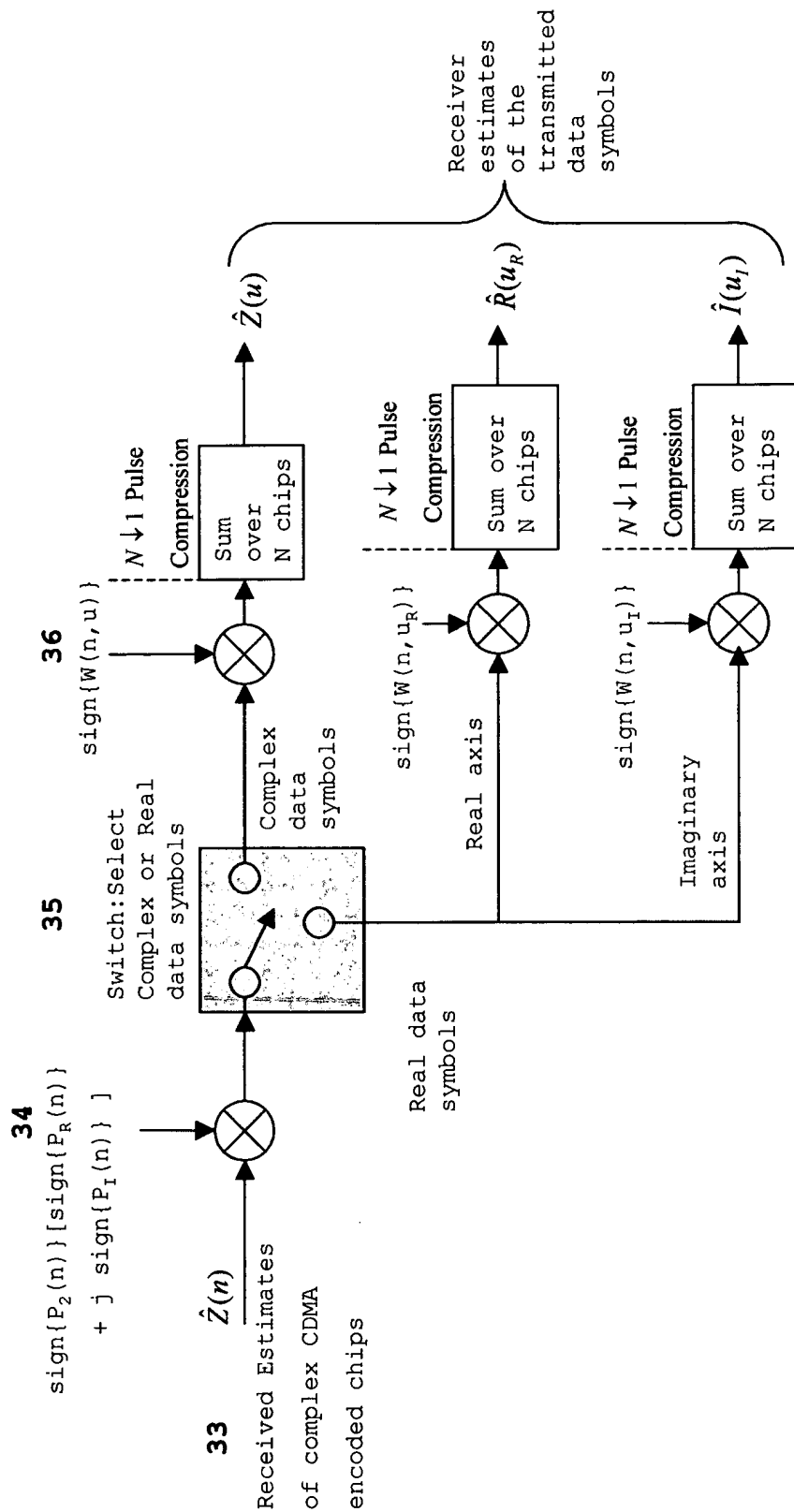


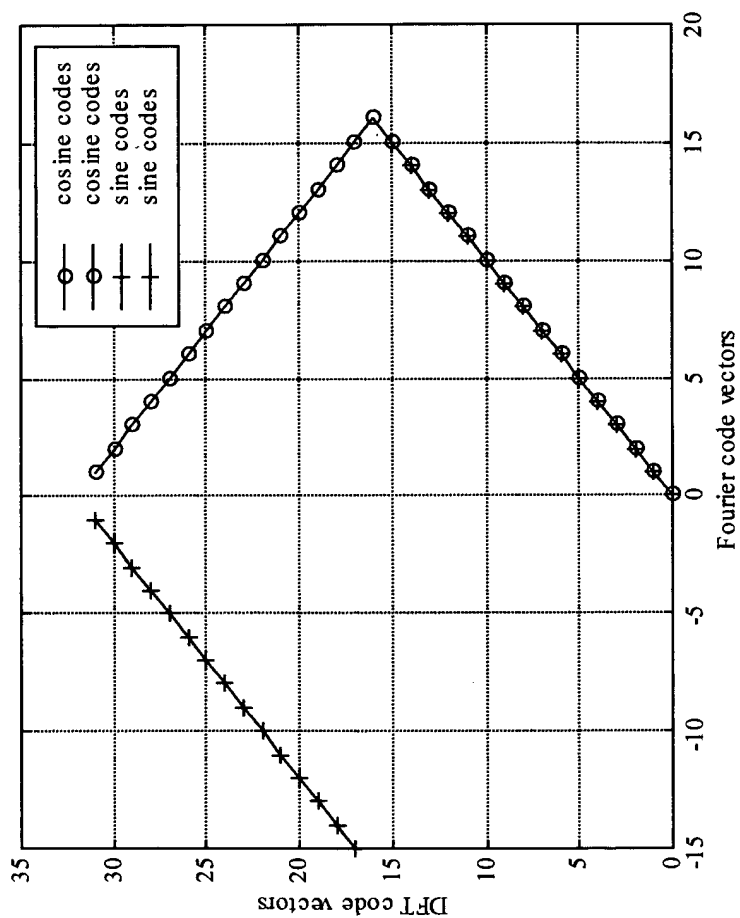


FIG. 4 Real Walsh CDMA Decoding Implementation





**FIG. 5 Correlation of Fourier Codes  
with DFT Codes for N=32**





**FIG. 6A Hybrid Walsh: CDMA Encoding Implementation**

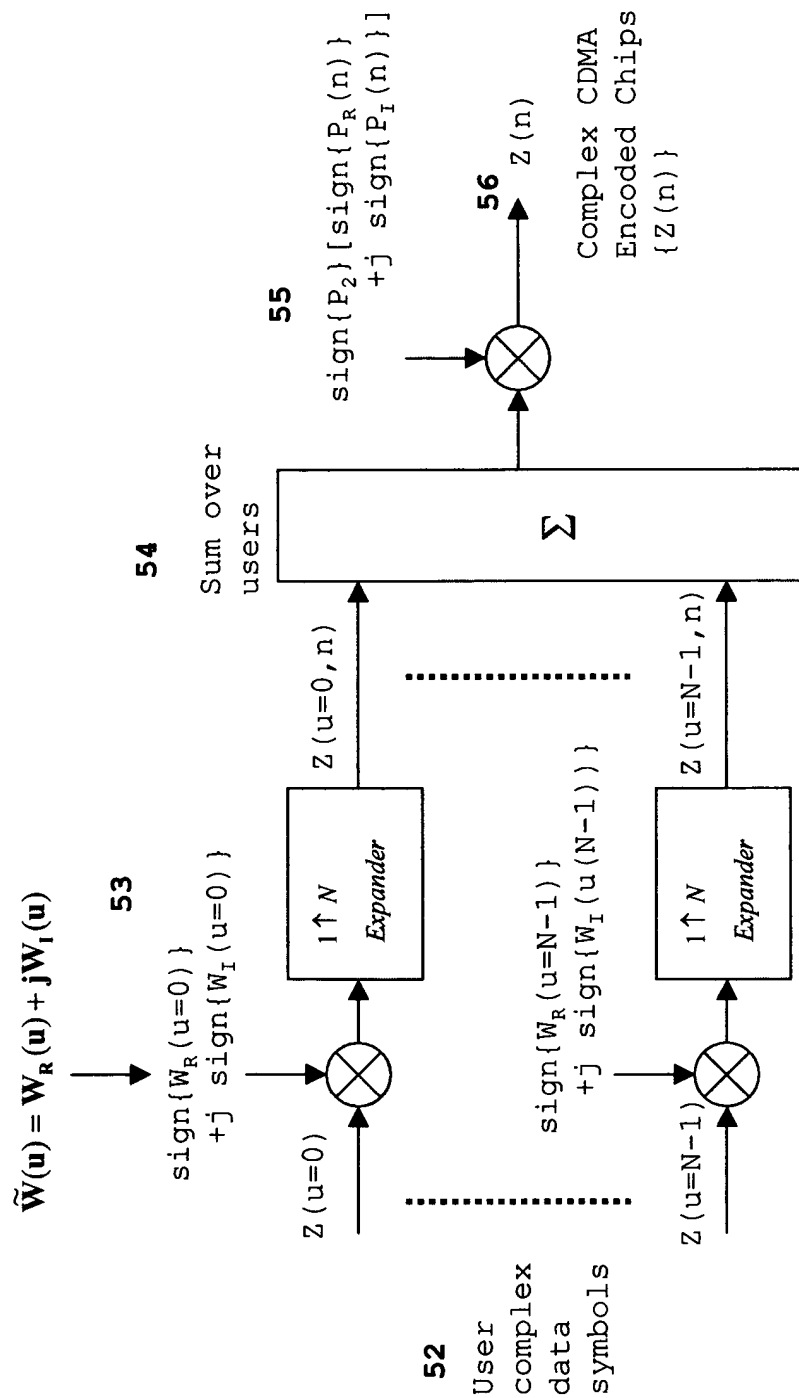
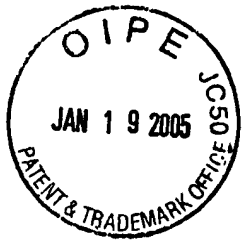


FIG. 6B Hybrid Walsh: Implementation Algorithm

Sequence index	Hybrid Walsh reordering permutation of the real Walsh code vectors	Hybrid Walsh quadrature (imaginary) code vector $W_I(u)$	Hybrid Walsh inphase (real) code vector $W_R(u)$	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$
$u=0,1,\dots,N-1$	Hybrid Walsh reordering permutation of the real Walsh code vectors	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$	$W_R(u) = W(0)$ $W_R(u) = W(2i)$ $W_R(u) = W(N-1)$ $W_R(u) = W(N-1-2\Delta u)$	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$
$u = 0$ $u = 1 \text{ to } (N/2-1)$ $u = N/2$ $u = N/2+\Delta u$ for $\Delta u=1 \text{ to } N/2-1$	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$	$W_R(u) = W(0)$ $W_R(u) = W(2i)$ $W_R(u) = W(N-1)$ $W_R(u) = W(N-1-2\Delta u)$	$W_I(u) = W(0)$ $W_I(u) = W(2i-1)$ $W_I(u) = W(N-1)$ $W_I(u) = W(N-2\Delta u)$



**FIG. 6C Hybrid Walsh: Implementation Algorithm  
Based on Even and Odd Real Walsh Codes**

Sequence index	Hybrid Walsh reordering permutation of the even and odd Walsh code vectors	Hybrid Walsh inphase (real) code vector $\underline{W}_R(u)$	Hybrid Walsh quadrature (imaginary) code vector $\underline{W}_I(u)$
$u=0, 1, \dots, N-1$			
$u = 0$		$\underline{W}_R(u) = W_e(0)$	$\underline{W}_I(u) = W_e(0)$
$u = 1 \text{ to } N/2-1$		$\underline{W}_R(u) = W_e(u)$	$\underline{W}_I(u) = W_o(u)$
$u = N/2$		$\underline{W}_R(u) = W_o(N/2)$	$\underline{W}_I(u) = W_o(N/2)$
$u = N/2+\Delta u$ for $\Delta u=1 \text{ to } N/2-1$		$\underline{W}_R(u) = W_o(N/2-\Delta u)$	$\underline{W}_I(u) = W_e(N/2-\Delta u)$

FIG. 6D Hybrid Walsh: Cellular Transmitter Implementation

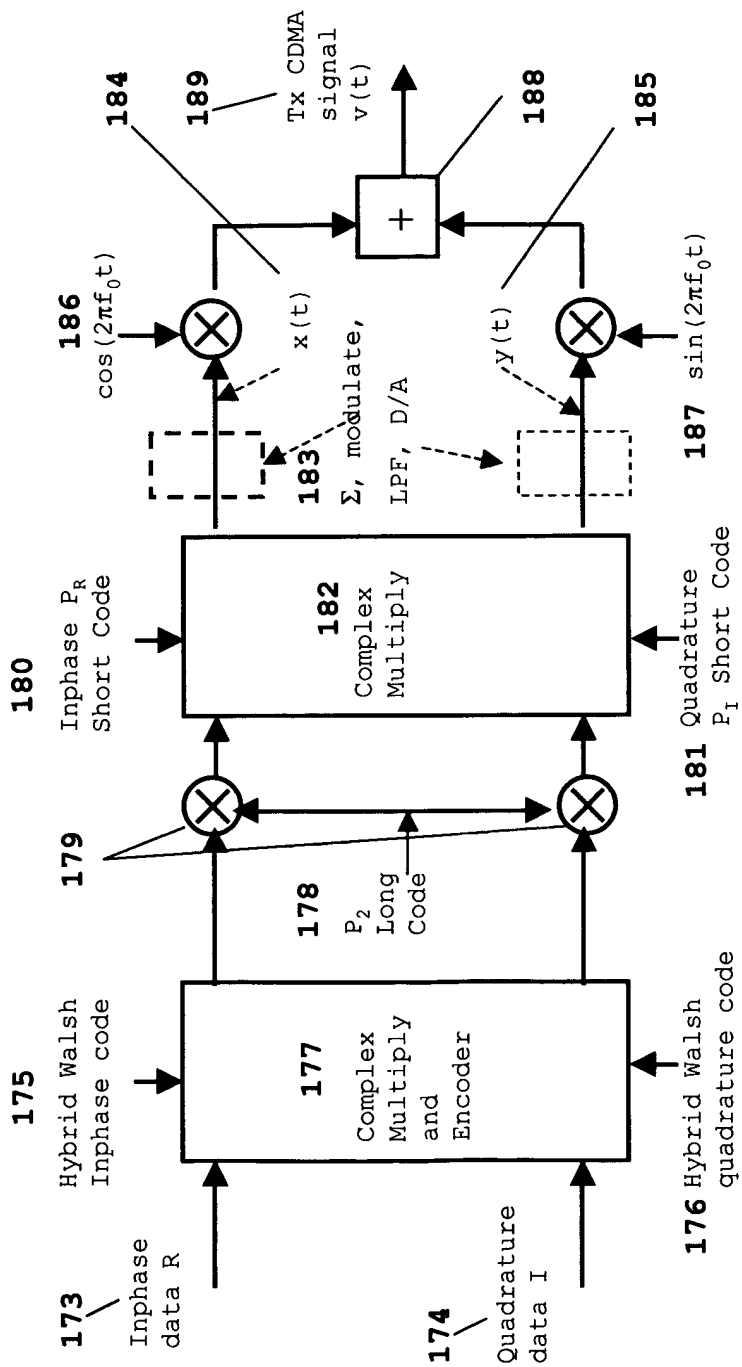




FIG. 7A Hybrid Walsh CDMA Decoding Implementation

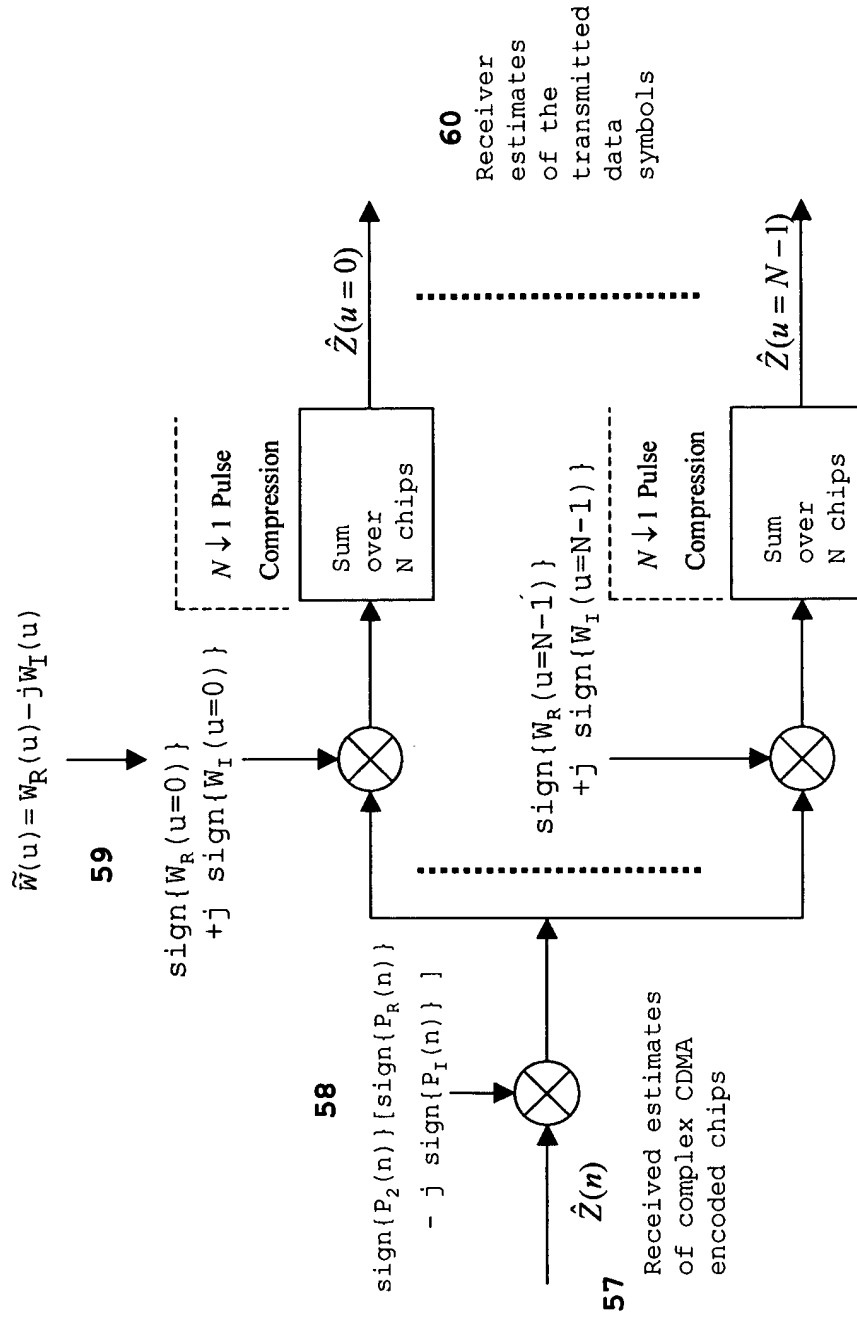




FIG. 7B Hybrid Walsh: Cellular Receiver Implementation

